

Chapman (N. H.)

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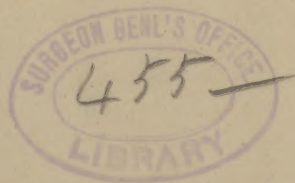
EXTENSIVE SCALDING  
FROM PROLONGED EXPOSURE TO STEAM AT  
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BY

NORMAN H. CHAPMAN, M. D., M. S.,

*Associate Member of the Biological and Microscopical Section of the Academy of Natural Sciences.*

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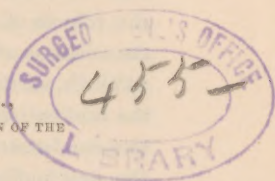
COMPLIMENTARY.

Chapman (N.H.)

## EXTENSIVE SCALDING FROM PROLONGED EXPOSURE TO STEAM AT HIGH TEMPERATURE.

By NORMAN H. CHAPMAN, M.D., M.S.

ASSOCIATE MEMBER OF THE BIOLOGICAL AND MICROSCOPICAL SECTION OF THE  
ACADEMY OF NATURAL SCIENCES.



A PERSON can scarcely enter a large hospital in these days of the varied uses of steam, powder, coal oil, and friction matches without seeing one or more cases of burns or scalds; but it is not often that one has the opportunity of observing a large number of these injuries from a single accident. Such an opportunity, however, recently occurred at the Pennsylvania Hospital, and was occasioned by an accident upon the West Jersey Railway at May's Landing. From this accident there were admitted into the wards of Dr. R. J. Levis (under whom I was at the time serving as substitute resident-surgeon) twenty-nine cases of scalding from exposure to steam. Of this number fifteen subsequently died, or a mortality of over fifty per cent.

The mode of occurrence of this accident is somewhat singular and worthy of notice. An excursion train was on its return from Atlantic City to Philadelphia in two sections. The locomotive of the last section ran into the rear car of the first, which was not in motion at the time, and partly telescoped it. A platform sill in the end of the car came in contact with the advancing engine, and struck it in such a manner as to break a joint in what is known as the branch steam-pipe. It was from this broken joint that the steam escaped and shot directly into the car. This steam could not diffuse itself to any extent in the open air, owing to the fact that the hole in the end of the coach was virtually stopped up by the telescoping engine, together with the coincident that the windows of the car were at the time all closed on account of a violent rain storm. The escaping steam being thus forced into a limited and comparatively closed space, the resulting temperature must have been high, and have remained so for a considerable period.

In order to get at an approximate estimate of the degree of heat to which these victims were exposed, let us for a moment suppose that the engine was at the time of the accident carrying one hundred and twenty-five pounds of steam—which is a minimum estimate, an engineer would scarcely think of carrying less,—then the temperature of the con-



fined steam must have been  $349^{\circ}\text{F.}$ <sup>1</sup> As soon, however, as this confined steam came in contact with the atmosphere it began to decrease in temperature, and continued gradually to lose this high heat as it was projected further and further into the car. Now it is a fact well known to practical engineers that a volume of steam escaping from a boiler under high pressure will travel a goodly number of feet, varying of course according to the volume of steam and the pressure under which it escapes as well as the coolness of the surrounding atmosphere, before it is brought down to  $212^{\circ}\text{F.}$ , so that it would seem probable that the first steam thrust from the broken joint reached the front end of the car without being reduced to a condensation temperature. This high temperature was not over with the first puff of steam, but by its continual escape until the boiler was exhausted, it was kept up for several moments. After the steam began to blow down, however, and the pressure of the confined steam, as indicated by the gauge, became gradually less and less, the temperature of the escaping steam also declined in a corresponding manner until it reached  $212^{\circ}\text{F.}$ , as the last was expelled from the boiler. It is improbable, as I am informed by practical engineers, that the boiler could have exhausted itself in less than from fifteen to twenty minutes, and also that the car could have cooled down in much less than half an hour. I do not mean that the temperature was all this time above  $212^{\circ}\text{F.}$ , but it was certainly above this point for at least from five to six minutes.

Just the degree of heat required to produce a scald is uncertain. The steam heat of a Russian bath, which is almost identical with the conditions under which the present accident happened, cannot be endured with impunity above  $150^{\circ}\text{F.}$  This temperature, as I have abundantly tested, produces a decidedly uncomfortable irritation of the skin, which lasts for hours. Neumann<sup>2</sup> tells us that a moist heat of from  $167^{\circ}\text{F.}$  to  $212^{\circ}\text{F.}$  will elevate the epidermis, and that  $212^{\circ}\text{F.}$  and over will destroy the skin either in part or throughout its entire thickness.

At the time of the accident only those persons seated near the front end of the car were able to escape before they were exposed to the action of the steam for any number of moments, the remainder of the occupants were detained for a longer or shorter period, fully one-third remaining until they were carried out after the car had sufficiently cooled down to allow persons from the outside to enter with safety. Unfortunately, this accident occurred near a river, a portion of the train standing upon the bridge, and many of those who were able to get out of the car, either from choice or accident, ran directly into the water, where they plunged about, and were with difficulty prevented from drowning themselves. Those who did not go at once into the river were almost as thoroughly drenched by the rain, which was then "pouring in torrents."<sup>3</sup> The clothing of the

<sup>1</sup> Haswell's Tables on Steam.

<sup>2</sup> Handbook of Skin Diseases, Bulkley's translation, p. 256.

<sup>3</sup> Dr. D. B. Ingersoll, of May's Landing, Letter of Sept. 13, 1880.

majority of the victims was more or less saturated with water upon admission to the hospital.

There was a marked similarity in all these cases as to the location and the extent of surface injured. The parts most uniformly affected were those exposed, or unprotected by clothing, and to which the steam had easy access. The hands, wrists, face, ears, and neck were in each case more or less injured. The scalds were by no means all alike in severity, however, some were much more serious than others; a difference which was mainly due to peculiarities in dress, together with the situation in the car and the order of escape. Those persons seated in the front end of the car and who were among the first to escape, were less seriously injured than those seated in the rear or middle of the coach. Dress also made a difference. Those clad in thin muslin or linen received little or no protection from their clothing. The steam almost instantly saturated any form of cotton or linen fabric which immediately covered the skin, and caused it to adhere sufficiently close to scald. Those who were fortunate enough, however, to have on woollen, either in underwear or outside garments, received no injury except about the head and hands—parts exposed—their clothing serving as abundant protection to the rest of the body. The women who were, as a rule, clad in muslin and tarlatan garments, were, owing to this peculiarity in dress, much more seriously injured than the men. There were exceptions to this, however, notably two cases, one being that of a lady who had on woollen underwear throughout, and was not scalded except about the head and hands; the other a gentleman, wearing linen pants and an alpaca coat, whose lower extremities were scalded to above the knee and the upper to above the elbow.

It was not until six hours after the accident happened that these cases were admitted to the hospital, and their condition was at that time most distressing. Indeed I know of no class of injuries occurring in civil life that are more intensely painful or produce a more profound impression upon the system at large than extensive burns and scalds. If the injury is cutaneous, and does not entirely destroy the papillary layer of the skin, as it did not in these cases, the agony is extreme.

Upon admission the victims all exhibited a condition of more or less profound shock to the nervous system. At first it seemed almost impossible that so much constitutional depression should accompany the majority of these cases. In fact it was repeatedly observed that the amount of shock seemed greatly out of proportion to the extent of injury. In burns and scalds it is by no means infrequent to observe this disproportion between the amount of shock and injury. Holmes, in his "System of Surgery," says that comparatively slight burns may be followed by great constitutional disturbance. I think, however, that while the scalding may not be, in these cases, the only element which took part in the production



of shock, still it is abundantly accounted for when we take into consideration all the preceding and accompanying events. The passengers were excursionists, and many of the men had most likely been drinking before they reached the seashore in the morning. During the day they ate, drank, bathed, and danced. At night when well exhausted they were crowded into the cars and started for home. When the accident happened they either escaped or were carried from the car into a drenching rain storm, or plunged into the river, as the case may be. After being crudely dressed they were additionally exposed to hours of weary waiting in an open station-house, and to railway, ferry, and ambulance transportation. They arrived at the hospital after midnight of the day upon which they started out, where after being cleaned and dressed—a slow process—they were put to bed. Remembering this series of events, and the amount of injury done, it would seem natural to expect a considerable amount of constitutional disturbance.

The scalds were mainly superficial in character, elevating the cuticle into vesicles and bullæ. When first seen the epidermis upon the face and neck was either entirely off or hanging in large pieces, smaller vesicles and bullæ clustered about the ears, and not infrequently the entire cuticle slipped from the hand like a glove. As a rule the injury did not extend below the papillary layer of the skin, there were instances of deep or gangrenous scalds, however, in which the whole thickness of the corium was destroyed.

These cases all suffered more or less from the inhalation of steam. The majority of them being detained in the car for several minutes, were of necessity obliged to inhale it in large quantities. The steam inspired was of nearly the same temperature as that which came in contact with the integument and produced a somewhat similar injury to the mucous membrane lining the air passages. The buccal cavity, the posterior nares, and the pharynx were all affected in this way. It was owing to this superficial scalding of the mucous membrane of the throat that the symptom of great thirst (which is always a prominent one in burns and scalds) was so well marked in this series of cases. Indeed it seemed almost an impossibility to quench their thirst at all. The after-effect of this superficial scalding was also well marked. It set up a degree of inflammation in the pharynx which seemed inclined to travel downwards along the air-passages, and give rise to serious bronchial irritation; the larynx and larger bronchi becoming almost universally affected, and in many cases there was subsequently developed an inflammation in the smaller bronchial tubes.

Of the twenty-nine victims of this accident admitted to the hospital, seventeen were males and twelve females. Their ages ranged from twelve to forty-six years, averaging twenty-seven. The parts most uniformly affected were the face, ears, neck, pharynx, and upper extremities to the middle or lower third of the forearm. In the women the injuries to the upper extremities extended as a rule to the shoulders, with patches upon

the back and chest above the line of the corset. Three of the women were also scalded from the shoe-top to the groin, and the lower extremities of them all were more or less seriously injured. The amount of integument destroyed in each case varied from 260 to 1200 square inches, averaging fully one-quarter of the surface of the body. The temperature during the shock was invariably below the normal, going in some cases as low as  $97^{\circ}$  F. During reaction, which set in, at from eighteen to thirty-six hours after admission, the temperature as taken in the axilla ranged from  $99^{\circ}$  F. to  $104^{\circ}$  F., averaging  $101.2^{\circ}$  F. During the general fever process, which immediately followed reaction, the highest point touched in each case ranged from  $101.6^{\circ}$  F. to  $105.8^{\circ}$  F., averaging  $104.2^{\circ}$  F. Taking the series, nine cases died from shock or collapse, with but very little attempt at reaction, within thirty-six hours after admission. Out of these nine, vomiting (or rather a regurgitation of the contents of the stomach) was present in eight, diarrhœa in five, and delirium in the same number. Of those who survived the shock, six died (from the seventh to the fourteenth day), two from exhaustion alone, and four adding to this condition marked symptoms of capillary bronchitis. The complications which arose during the treatment of the twenty cases that did not perish from shock, were numerous. A peculiar and characteristic eruption was developed in fourteen cases; more or less bronchitis and severe bronchial irritation in the same number; a restless, anxious delirium occurred in ten, and delirium tremens in two; troublesome diarrhœa in eight, and occasional vomitings in four; erysipelas of an upper extremity in three; incontinence of urine in two; in one there was œdema of the glottis, and late in the treatment of three cases, abscesses formed in the pinna of the ear, which, when opened, discharged freely, and exposed its cartilaginous structure to view. In six of these cases there was also a partial or complete loss of voice. Ten of the entire number of victims admitted were clad in thin muslin or linen garments; six were known to have been in the river, and three to have had one or more chills prior to admission. There were four walking cases, which, at the time of the accident, were seated in the front end of the car, and fortunately the first to escape.

Notes<sup>1</sup> of ten additional cases which were retained at the seat of accident, and not sent to the hospital, show a similar extent of local injury, and of bronchial disturbance from the inhalation of steam. Of these ten cases, six perished from shock within the first thirty-six hours; three from exhaustion within two weeks, and one made a good recovery in the third week.

A short history of two cases will, on account of their great similarity, give a very good idea of the entire series:—

CASE V.—Mary McD., æt. 27 years, single, Irish, domestic, received superficial scalds over about one-third of the cutaneous surface, involving

<sup>1</sup> Kindly furnished me by Dr. D. B. Ingersoll, of May's Landing, N. J.



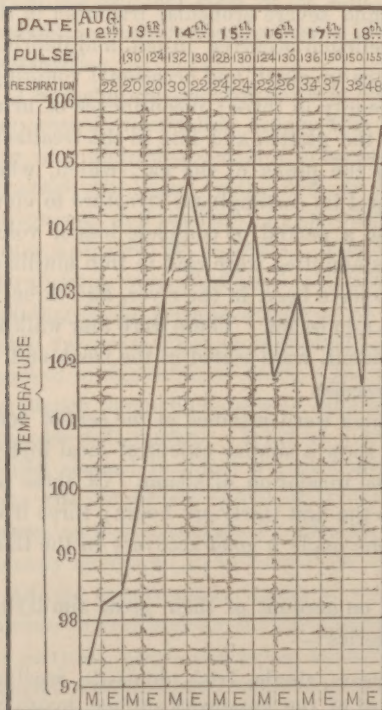
the face, ears, neck, and the upper extremities to the shoulders, together with patches upon both legs and the left knee. The mucous membrane lining the air-passages was also somewhat affected from the inhalation of steam, most markedly that of the pharynx and buccal cavity. Besides the scalding, there was a lacerated wound upon the outer side of the right wrist, which communicated with the joint. This was the only case in which there was injury other than that caused by steam.

The prominent symptoms were those of shock, great pain, distressing thirst, and partial loss of voice. The constitutional depression was well marked; the extremities were cold; the temperature below the normal; and there was early vomiting of large quantities of undigested food. The period of shock lasted until the second day, when violent reaction set in, and a stage of inflammation took its place. By reference to the following temperature chart it will be observed that about forty-eight hours after admission the temperature of reaction reached  $104.6^{\circ}$  F., and that from this time a constant fever temperature, with somewhat regular evening exacerbations and morning declines, was maintained.

Diarrhœa began on the second day, and continued more or less troublesome throughout. Upon the third day marked symptoms of bronchitis appeared—paroxysmal cough, hurried and oppressed breathing, viscid expectoration, a sense of soreness of the throat, and of pain under the

sternum. As the case advanced the cough lessened, the respiration was more hurried (80 to 87 per min.); and the pulse quickened (140 to 150 per min.). There were a few fine moist râles heard about the chest, and marked evidences of increasing general prostration. The voice was almost entirely gone, and it was with difficulty that the patient could be understood. Delirium, associated with great restlessness, set in early upon the morning of the fifth day. It was at first of a low type, which continued more or less severe until the morning of the second day following, when it became so violent as to require the bed-straps. Twenty-four hours prior to death a thickly set eruption appeared upon the chest and abdomen. It was of a dark, slightly livid colour, and appeared as small vesicles. The intervening skin was red and inflamed, there being little or no integument of normal colour. The closing struggle on the evening of the seventh day was accompanied by a kind of spasm such as is often seen in the last stage of œdema of the glottis.

Fig. 1.

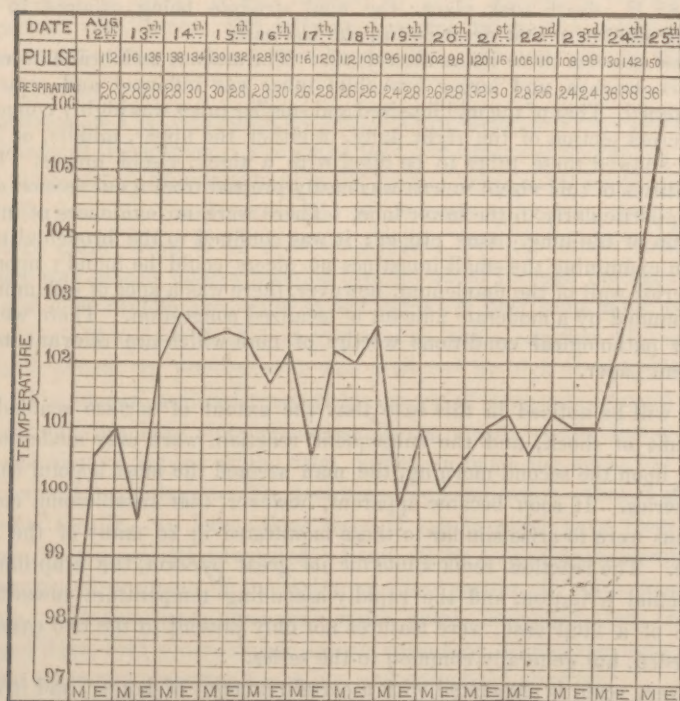




CASE XIX.—Charles F., æt. 32 years, was superficially scalded about the face, ears, neck, and hands; a glove of integument separating from the latter as high up as the lower fifth of the radius. The pharynx was also somewhat injured, giving a sense of soreness to the throat and a partial loss of voice.

The symptoms, upon admission, were here the same as in the case just recorded, except that the constitutional depression was less severe. The amount of shock was comparatively moderate, and the reaction which set in after eighteen hours was not at all violent. Subsequent to this mild primary reaction, however, a period of inflammation set in upon the third day, and was so severe as to constitute a state of general fever, as manifested by a full and frequent pulse, a dry and parched skin, a tongue red

Fig. 2.



and coated, and to these we may add distressing thirst, nausea, occasional vomiting, together with symptoms of pulmonary, cerebral, and gastro-intestinal congestion. During this inflammatory period, delirium and diarrhœa set in upon the fourth day. The delirium was associated with great restlessness, and was at first of a low, anxious type. It continued almost constantly (being somewhat quiescent at intervals) until the tenth day, when it was brought under control. The diarrhœa was a troublesome symptom throughout, requiring almost constant attention. Upon the eighth day an eruption similar to that described in Case V., but less livid in character, appeared. After being out four days, it turned pustular,

and remained so until after death. This eruption was confined to the trunk; over the chest it was thickly set, there being little or no healthy intervening integument; over the abdomen, back, and shoulders, it was, however, more scattered. During the second week the inflammation set up in the pharynx by the inhalation of steam began to extend downwards, and forty-eight hours prior to death symptoms of inflammation of the smaller bronchial tubes exhibited themselves. At this time there was hurried breathing, a rapid pulse, slight cough and expectoration, together with great restlessness, associated with an anxious expression of countenance. The percussion note was clear and somewhat high pitched,<sup>1</sup> and, upon auscultation, there were a few firm, moist râles to be heard over the right side of the chest. The eruption and the intervening integument grew somewhat livid as the case advanced, and the temperature, as will be seen by referring to the accompanying chart, steadily increased until, at 105.8° F., death took place; the final struggle being ushered in by a spasm similar to that described in the last case.

*Post-mortem* three hours after death:<sup>2</sup> The mucous membrane lining the larynx, trachea, and larger bronchial tubes was inflamed and somewhat thickened. That of the middle-sized and smaller tubes was highly congested, and cross section of the right lung, in either the upper, middle, or lower lobe, showed these tubes to be filled with a thick, viscid mucus. Large quantities of this viscid mucus was easily pressed from a cut section of the lung, particularly in the lower lobe. There were no evidences of inflammation of the lung tissue proper; it was confined to the bronchial tubes. Upon examining the small intestines no ulcers could be found; upon the posterior wall of the duodenum, however, there was a spot of inflammation surrounded by a moderate amount of localized congestion. There were no other pathological conditions worthy of note which are relevant to the present paper.

It will be noticed in this case that the extent of surface scalded, the amount of shock, and the subsequent reaction, were only moderate; in fact, upon the second morning, the man seemed the most hopeful case in the series. It soon became apparent, however, that troublesome complications were to arise similar to those manifested in so many of the other cases. The reaction, remarkable for its great pyrexia, the eruption, the bronchial irritation, and the rapidly ascending temperature towards the close of a fatal case, were features not only present in the two cases just recorded, but generally common to the series.

Every scald is associated with a certain amount of danger, and it is not always the severest scalds which are the most dangerous. Witness the case just recorded; it was at first thought to be the most hopeful one in the series, but it was attended with a fatal result. Again, "a man once walked into the Pennsylvania Hospital who had fallen into a vat or tank and was immersed in water not hot enough to produce more than a superficial irritation of the derma, and without in any place blistering, yet he

<sup>1</sup> Dr. John Forsyth Meigs remarked, upon examining this case just prior to death, that the percussion note was more than usually high pitched.

<sup>2</sup> Specimens examined by Drs. John Forsyth Meigs and R. J. Levis.



died within a few hours."<sup>1</sup> The danger from a scald is not over with the first shock and its subsequent reaction, but it is surrounded with peril in every period of its course. After the period of depression is passed, and it is followed by a proportionate reaction, a period of inflammation is set up as a reparative process. It is during this advanced stage that the internal organs, particularly the lungs and small intestines, are apt to become affected. If the case survive these dangers it has still to endure the exhausting influences of suppuration and repair.

The manifestations of shock were not alike in all of these cases. In some it produced extreme prostration of *muscular power*, stupor, a cold surface and extremities, quick, small pulse, and slow respiration, a state of collapse; in others it was marked by great agitation, excitement, restlessness, sleeplessness, and delirium; in still others *mania-a-potu* exhibited itself. The restless form of expression, however, was by far the most common.

*Treatment.*—The indications for treatment in these cases were plain and of paramount importance. The shock and constitutional depression were to be combated by such agents as would tend to bring about a safe and not too violent reaction; and to the local injuries the application of whatever dressings might seem to be most efficacious. For the former condition reliance was placed upon a reaction brought about through the agency of heat and mild stimulation—such as hot drinks of beef soup, milk, coffee, warmth in bed and artificial heat to the extremities, together with quinia and milk punch—in preference to that produced by high or over-stimulation. The idea of a forced reaction by the use of large quantities of alcoholic stimuli has long since given way to the desire to establish a more safe and natural return of the vital powers through the agency of heat and moderate stimulation. To meet the second indication—that of affording relief locally—we have a long series of agents which have, from time to time, been especially advocated. Some of the best of these agents are the benzoated ointment of the oxide of zinc,<sup>2</sup> carron oil,<sup>3</sup> bicarbonate of sodium,<sup>4</sup> collodion and olive oil,<sup>5</sup> white paint, cosmoline, raw cotton, dredged flour, cold water, starch, brown resin-soap, lime-water with chlorinated ether and glycerine,<sup>6</sup> gasoline, and carbolized olive oil.<sup>7</sup>

<sup>1</sup> Dr. R. J. Levis on "Burns," in Philadelphia Medical Times, vol. ix. p. 321.

<sup>2</sup> Dr. R. J. Levis, Philadelphia Medical Times, vol. ix. p. 322.

<sup>3</sup> A soapy emulsion of equal parts of linseed oil and lime-water, which becomes disgustingly offensive when combined with discharges.

<sup>4</sup> Herbert Kiernander, Lancet, August, 1879.

<sup>5</sup> New York Medical Journal, vol. xxiii. p. 174. Is used in the proportion of two parts of collodion to one of olive oil.

<sup>6</sup> M. de Bruyne, Amer. Journ. Med. Sciences, October, 1871, from British Med. Journal, August 19, 1871. His formula being one part each of hydrate of lime and chlorinated chlorohydric ether to fifty of glycerine.

<sup>7</sup> Dr. D. B. Ingersoll employed carbolized olive oil in the proportion of 1 part of acid to 128 of oil in the treatment of the cases retained at May's Landing.

While the recommended local dressings are legion in number, they apparently all aim at the same object, namely, that of protecting the injured parts from exposure to the external air. The desiccating influences of the atmosphere are always distressing to the injured person, and the excessive fetor which emanates from the decomposing tissues of a badly burnt case is equally detrimental to patient and to all who may chance to occupy the same ward or apartment. Local applications should, therefore, be not only soothing and non-irritant, but disinfectant as well, and especially is this a most important point where large numbers of these cases are collected together in crowded hospitals, as was the case in the present instance. With this point in view strongly carbolized oxide of zinc ointment<sup>1</sup> was employed, and found to answer admirably. The carbolic acid, being a local anæsthetic as well as an antiseptic, had the effect of not only mitigating the pain, but also of materially lessening the offensive effluvia from the body. The ointment was spread upon cloths, laid over the injured parts, and held in place by the roller. About the eyes and nose, where it was difficult to keep a fixed dressing, cosmoline was smeared with excellent effect. The dressings were removed daily, and, in some cases, where the suppuration was exceedingly profuse, twice during the twenty-four hours.

To meet special indications, a number of different remedial agents were used. As a soothing application to the eye, atropia or a solution of biborate of sodium in camphor water was employed. For the general fever process reliance was placed upon quinia, digitalis, veratrum viride, citrate of potassium, sweet spirits of nitre, and the effervescing draught. For the diarrhœa, opium, chalk, bismuth, and the salts of lead. For the throat and lung complications, gargles and sprays of chlorate of potassium and myrrh, solutions of carbolic acid, etc.; dry cups or turpentine stupes to the chest, with demulcents and expectorants internally, together with quinia and alcoholic stimuli. In preventing contraction and deformity much was accomplished by attending to position and passive movements. Under careful mechanical treatment the cases which recovered presented generally a very decent and tolerable appearance. The cicatrices were all soft and pliable, there were no hardened bands or keloid growths developed in any of the cases, in fact aside from the reddened discoloration the appearance was excellent. Any contraction of the palmar tissues was prevented by constantly keeping the fingers extended to the utmost limit; and any webbing of the fingers by keeping them separated with strips of muslin covered with zinc ointment and well tucked down towards the body of the hand, so that the healing surfaces were prevented from touching one another. By thus almost constantly keeping the parts upon the stretch

<sup>1</sup> In preparing this ointment the carbolic acid must be incorporated with the oxide of zinc at the time it is made, or it will not be equally diffused; and one part of the acid to thirty-two of the ointment is about as strong as should be employed.



and employing passive movements whenever the dressings were removed, the resulting cicatrices were very satisfactory.

*Remarks.*—During the treatment of these cases certain trophic disturbances occurred which are worthy of note. Pre-eminently among these was a characteristic eruption. Out of the nineteen cases that were living at the beginning of the second week fourteen developed this eruption. The lesion was peculiar in character, and its manifestations were almost uniformly the same. As a rule it came out suddenly, or without premonition, from the sixth to the eighth day. It was vesicular in character, and attended by a tingling burning sensation. The vesicles were small, pin-head or millet-seed in size, somewhat elevated above the level of the skin, and of a light or purplish-white colour. They were present in exceedingly large numbers, and irregularly distributed over the chest, abdomen, back, and shoulders, being most closely crowded together upon the chest. On account of the eruption being so thickly set upon the chest, and each vesicle being surrounded by an inflamed areola, there was little or no healthy intervening integument. The vesicles remained discrete, exhibiting no tendency to coalesce, or to rupture spontaneously. When recent, these vesicles contained a clear, watery fluid, but when older their contents became brown or purulent. This change, from vesicular to pustular, usually took place after the eruption had been out from four to six days. The vesicles thus ran an acute course and terminated in desquamation in about two weeks. This eruption differed from a vesicular eczema in the suddenness of its appearance; in the vesicles not being confluent or exhibiting a tendency to spontaneous rupture, and thus allowing the fluid to dry into yellowish crusts. It differed from a dermatitis in the severity of the local manifestations; in that the skin was not markedly swollen, œdematous, or in a state of high inflammation; in the vesicles not continuing to grow in size after once having made their appearance, and finally when well distended to rupture spontaneously. It was rather a form of miliaria, and more particularly that known as miliaria rubra,<sup>1</sup> due to a suppression of the functional action of the skin, with a subsequent inflammation of the sweat glands. This eruption is of comparatively rare occurrence, and manifests itself most commonly in weak and profoundly debilitated conditions of the system, and seems to be an effort on the part of nature to regain itself.

The question may be raised as to whether this eruption was not due to some topical application, and particularly to the carbolic acid which was used in the oxide of zinc ointment and applied to the burned surfaces. A case of erythema urticatum has been recently reported by H. Zeissl<sup>2</sup> from the use of Lister's dressing. This eruption "appeared on the eleventh

<sup>1</sup> Duhring, *Diseases of the Skin*, p. 231.

<sup>2</sup> Philada. Med. Times, October 23, 1880, from Cbl. f. Chr. 1880, p. 542.

day and localized itself upon the back, sides, and extremities, displaying a diffuse patchy redness." The urine was "dark green," and the eruption faded when the carbolized dressing was abandoned. In the cases under consideration it is improbable that the eruption was caused by the absorption of carbolic acid into the system, for the miliaria ran a definite course which, when completed, subsided while the carbolized dressings were still being employed, and the urine was not charged as in the case mentioned by Zeissl. The suppression of cutaneous perspiration and its poisonous influences upon the blood<sup>1</sup> were abundantly sufficient to cause this miliaria rubra.

PHILADELPHIA, October, 1880.

<sup>1</sup> Billroth, "Traumatic Fevers and Traumatic Affections," *Langenbeck's Arch.* vi.





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